

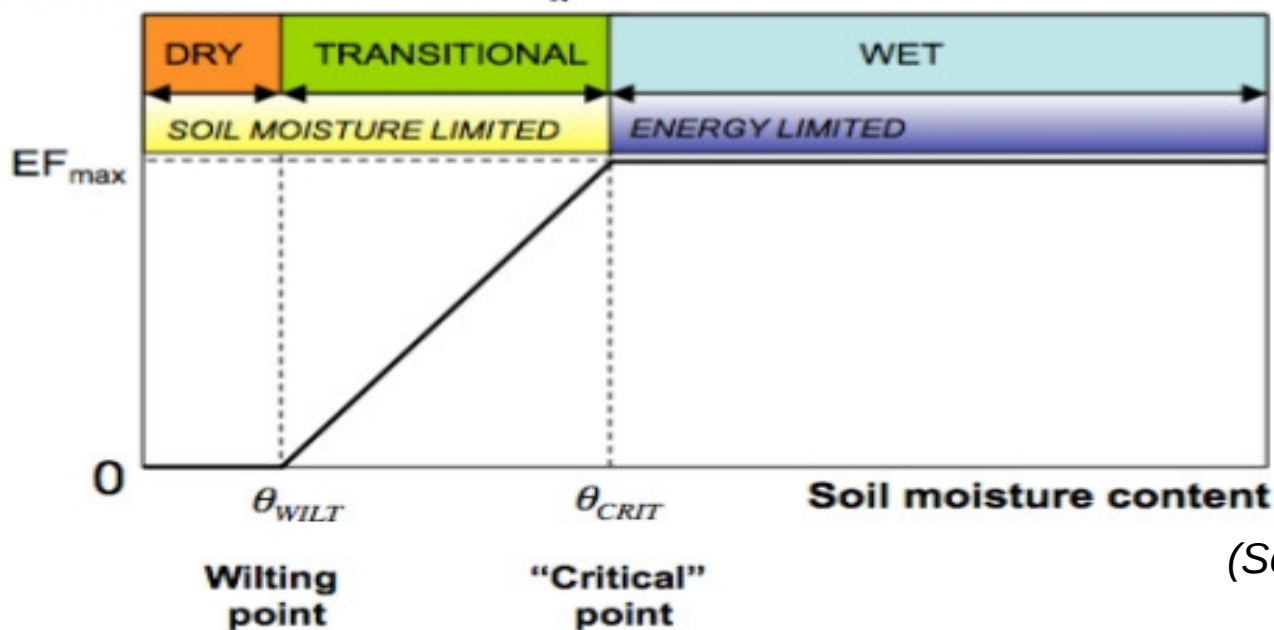
Impact of land-surface initialization on sub-seasonal and seasonal predictability in EC-Earth2.3

C. Prodhomme, O. Bellprat, F. Doblas-Reyes

EC-Earth meeting, Lund, 29/09/2014

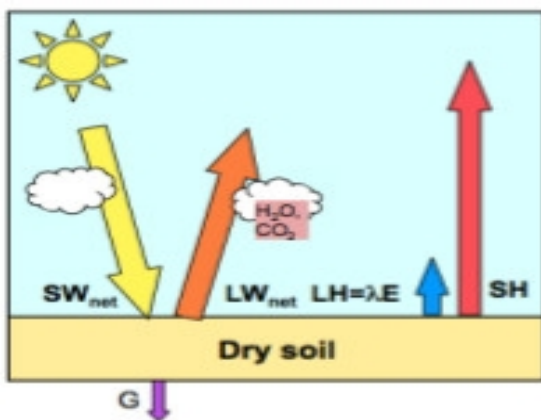
Introduction

Evaporative fraction $EF = \lambda E / R_n$

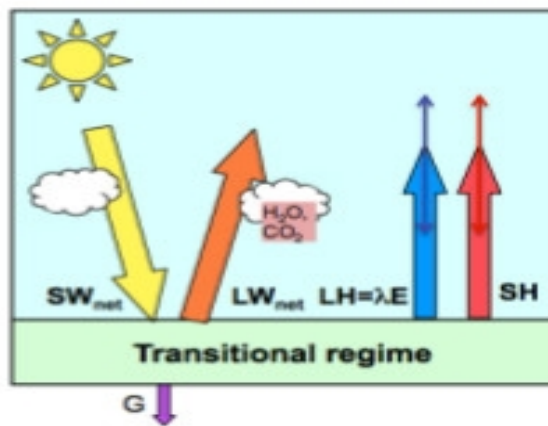


(Seneviratne et al., 2010)

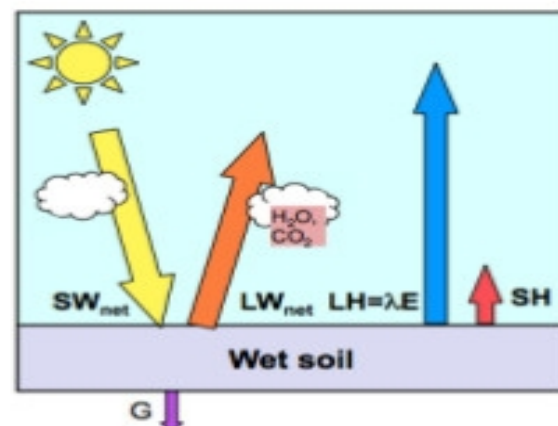
Dry climate regime



Transitional climate regime



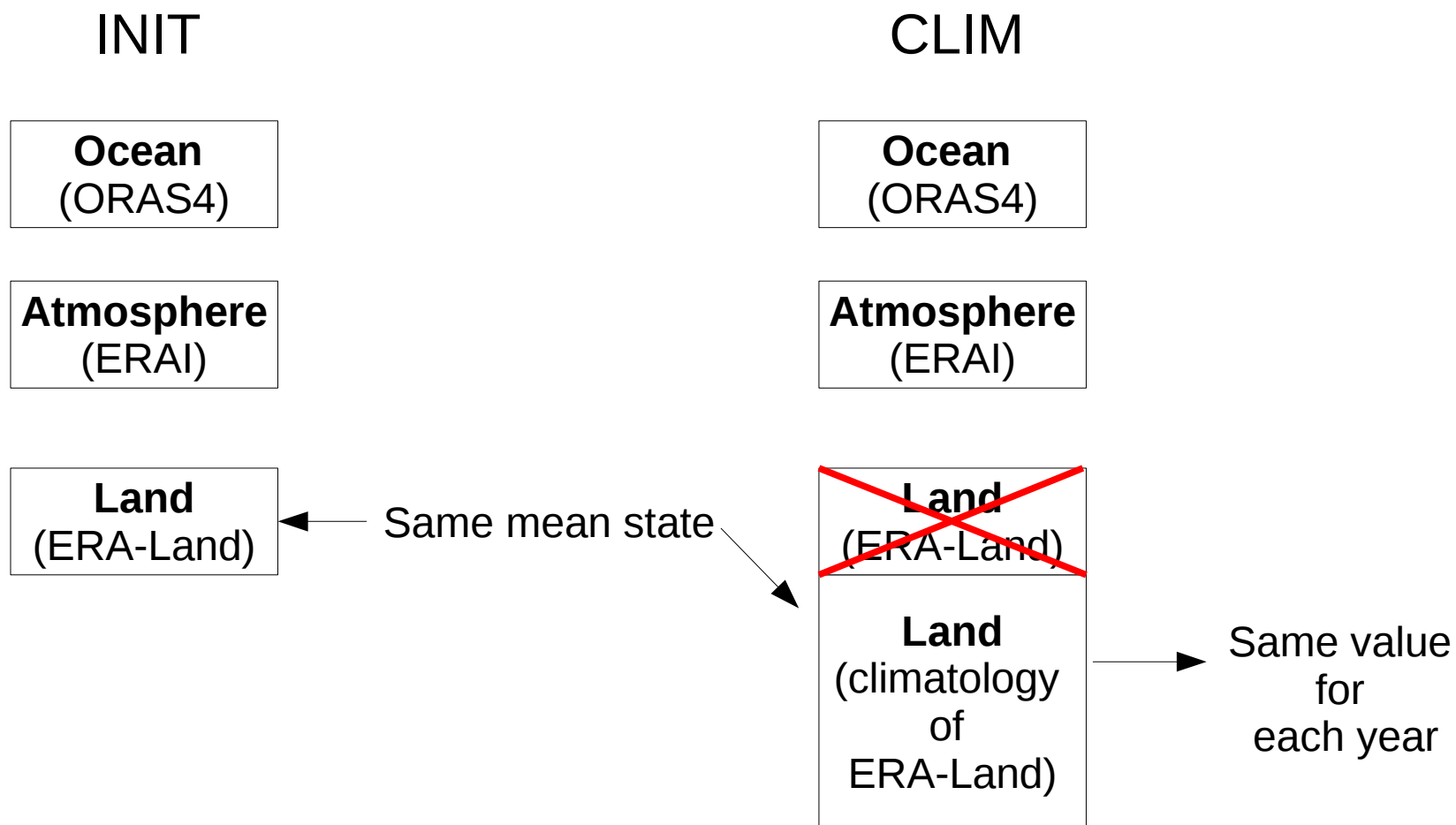
Wet climate regime



Experiments description

EC-Earth 2.3: 4 month long hindcast 1981-2010,
Focus on May startdate

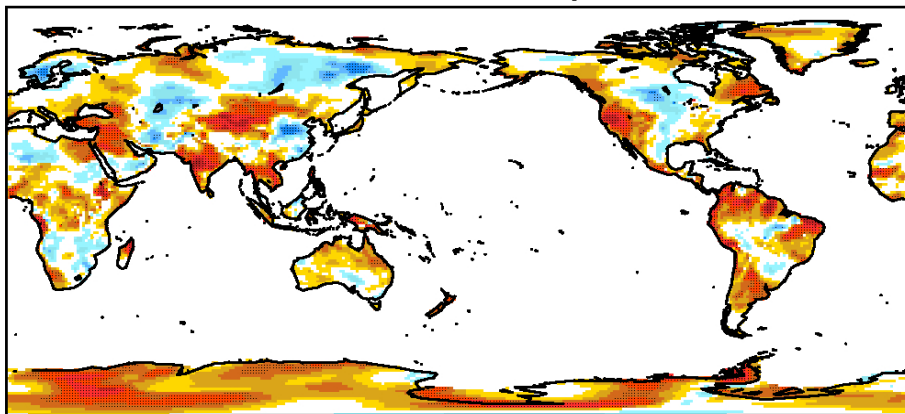
2 experiments using same configuration but different initial conditions:



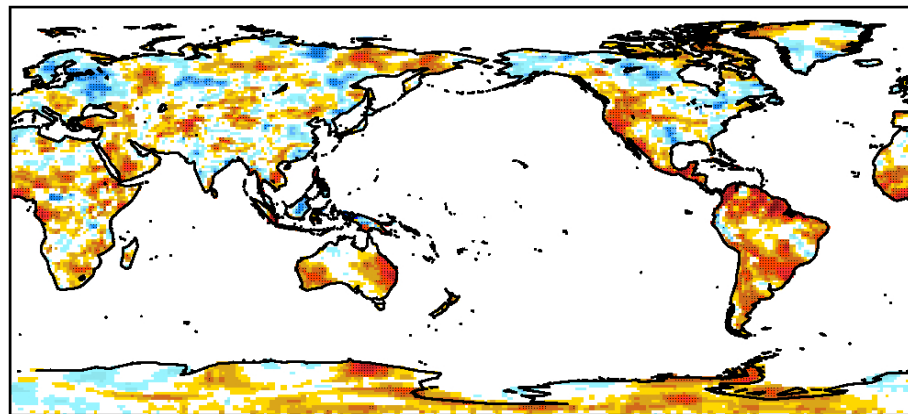
Correlation

Correlation with ERAint in JJA
(Residual of the regression with the Global Mean Temperature)

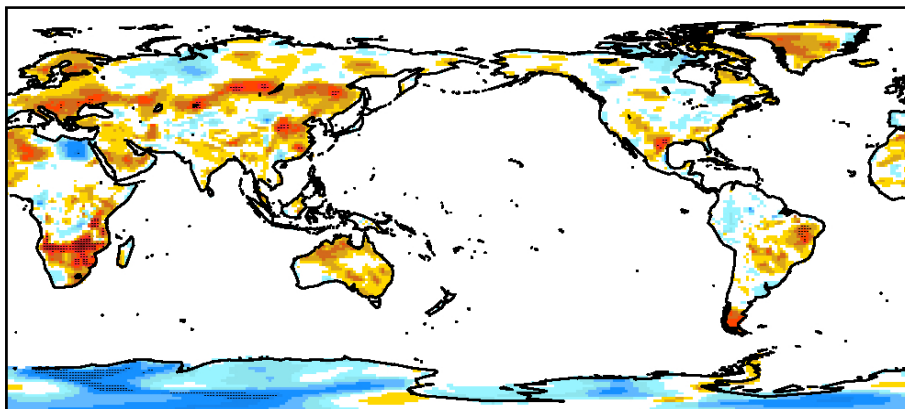
CLIM: 2m Temperature



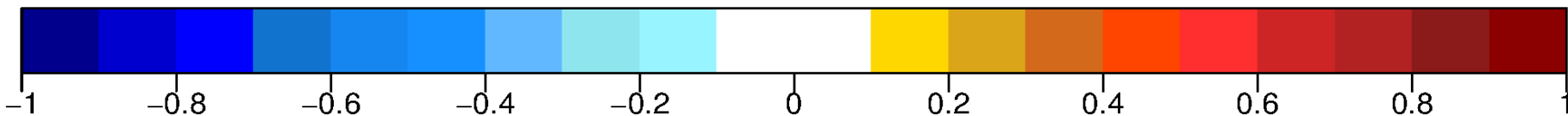
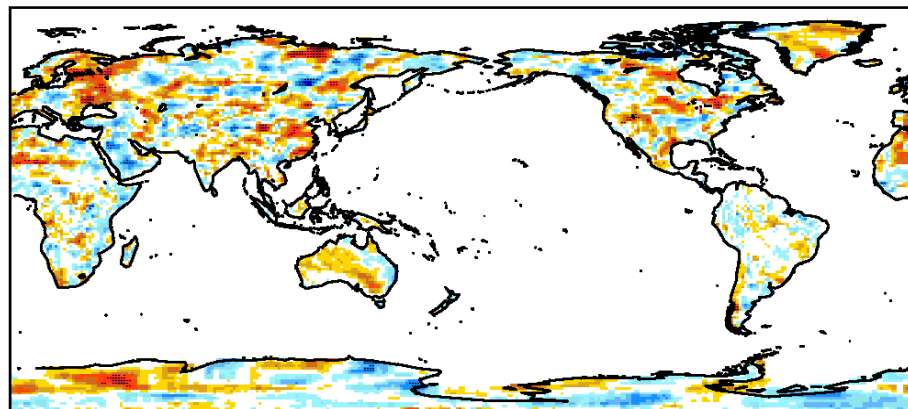
CLIM: Precipitation



INIT-CLIM: 2m Temperature

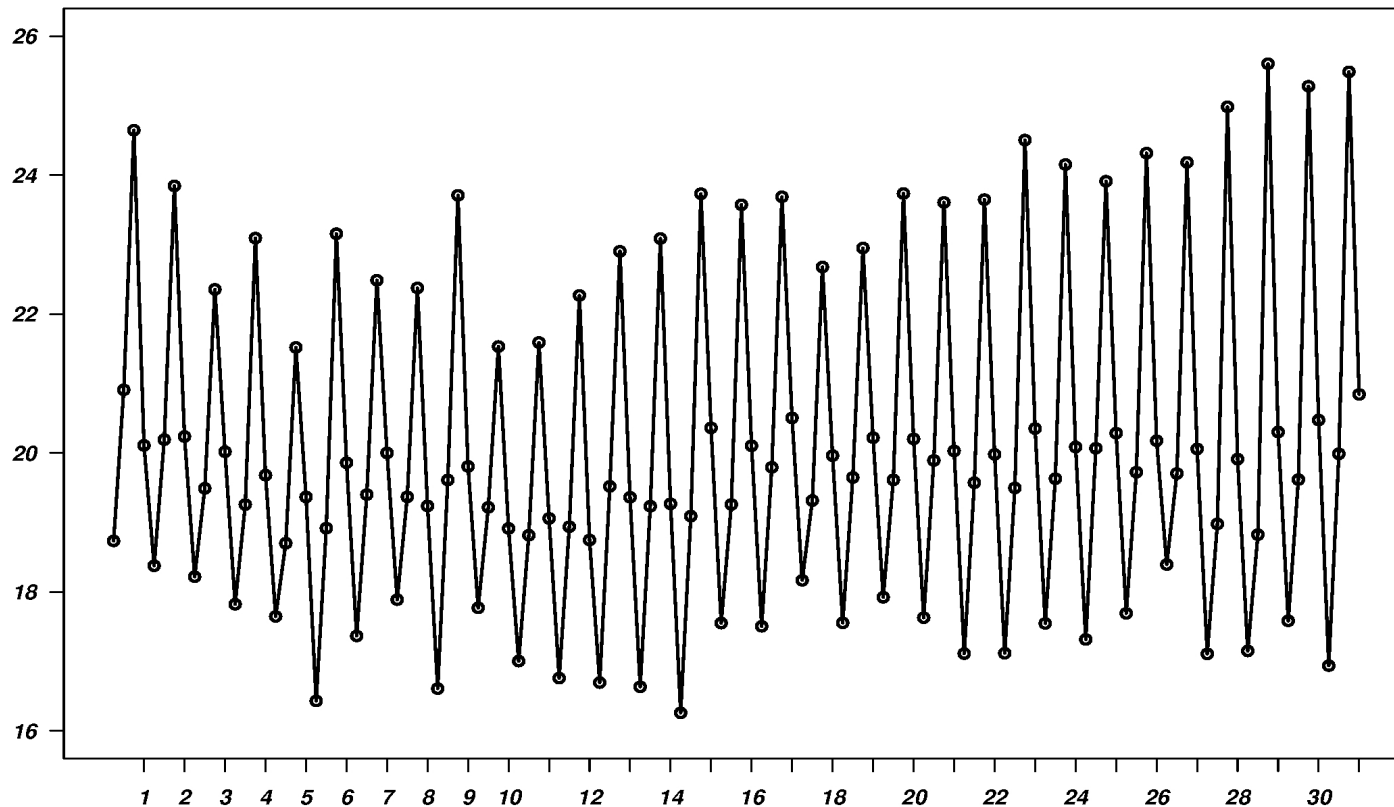


INIT-CLIM: precipitations



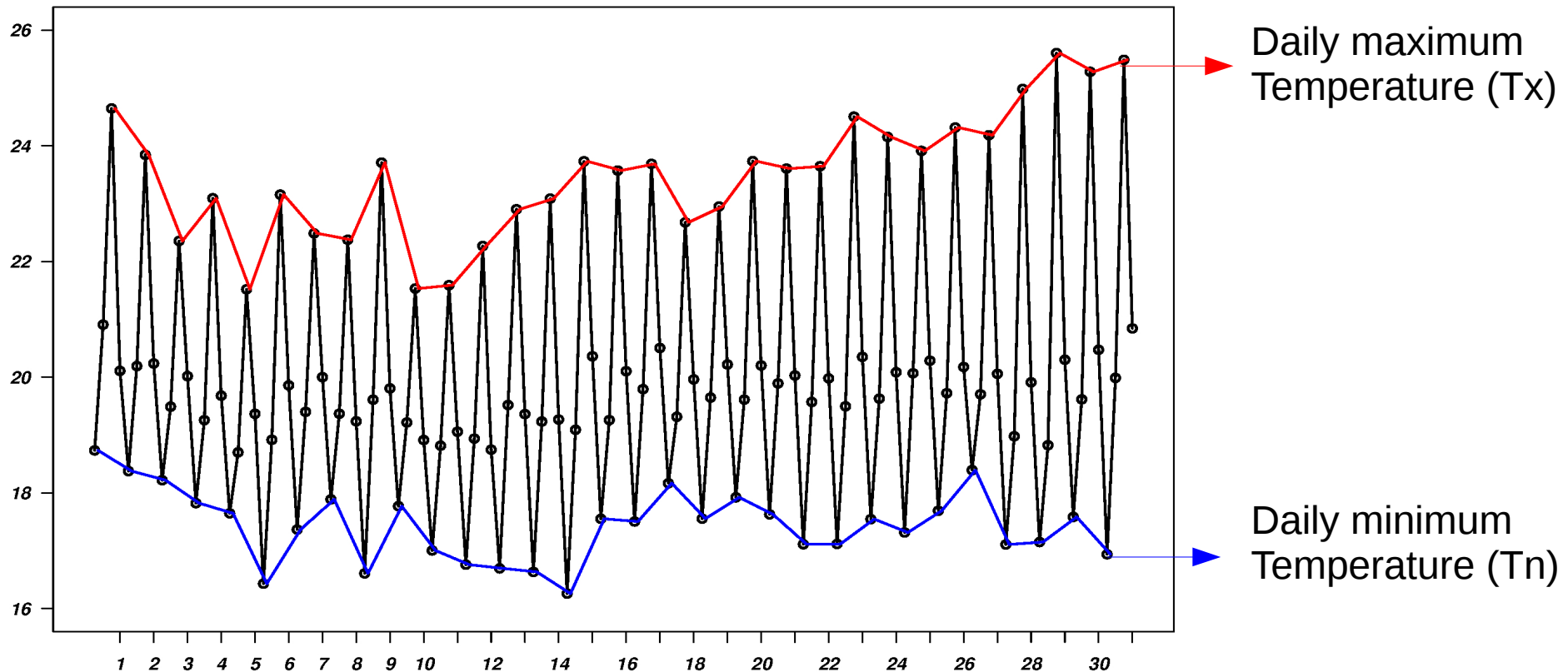
Focus on the “extremes”

Temperature (°C) in May 1985 in INIT (6 hourly)



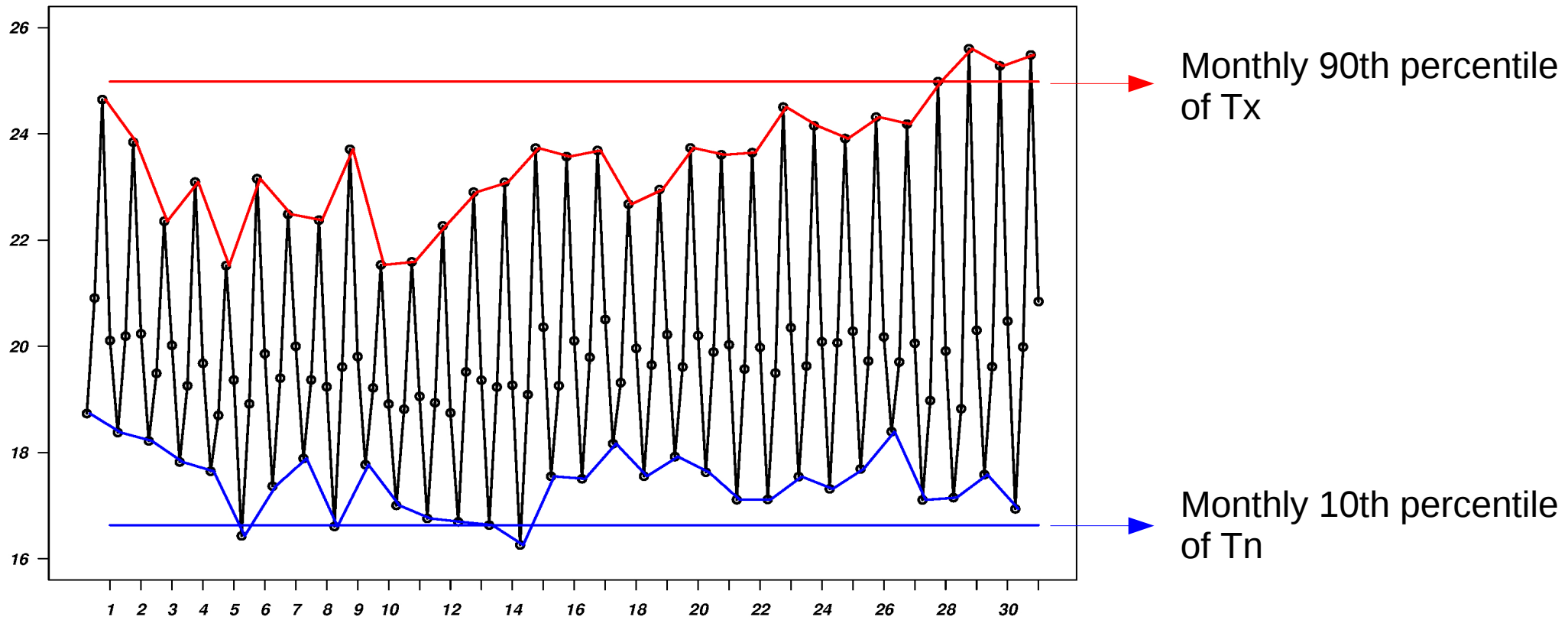
Focus on the “extremes”

Temperature (°C) in May 1985 in INIT (6 hourly)



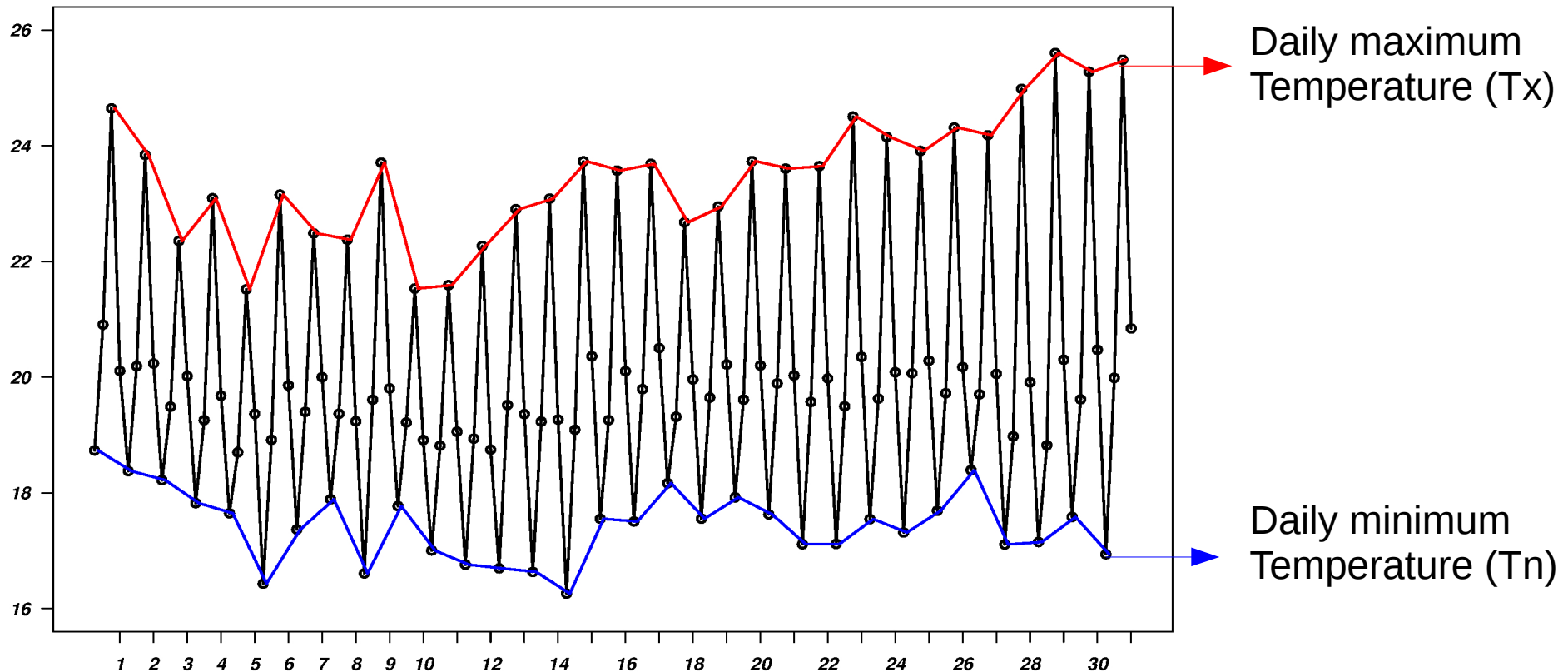
Focus on the “extremes”

Temperature (°C) in May 1985 in INIT (6 hourly)



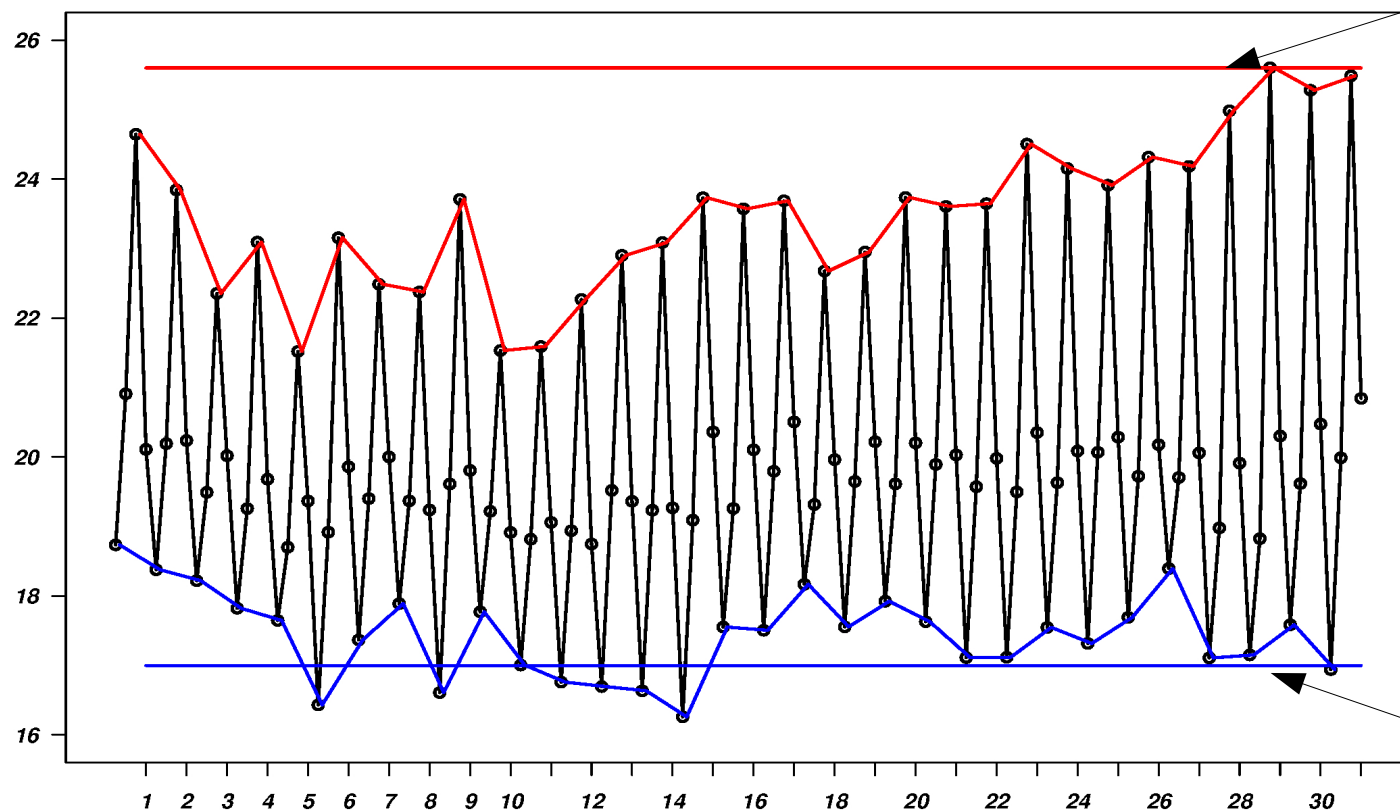
Focus on the “extremes”

Temperature (°C) in May 1985 in INIT (6 hourly)



Focus on the “extremes”

Temperature (°C) in May 1985 in INIT (6 hourly)

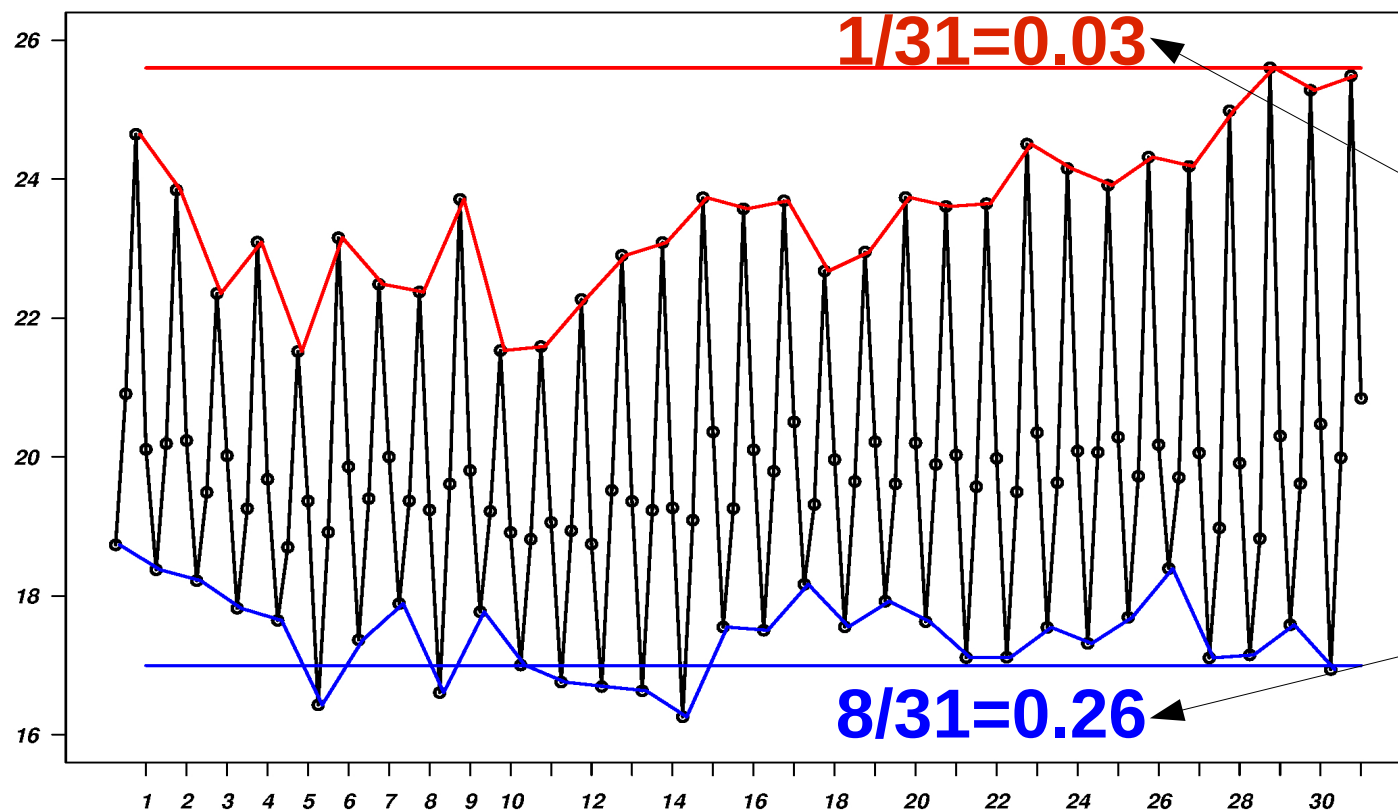


Climatological 90th
Percentile of Tx
over the whole period
(1981-2010)

Climatological 10th
Percentile of Tn
over the whole period
(1981-2010)

Focus on the “extremes”

Temperature (°C) in May 1985 in INIT (6 hourly)

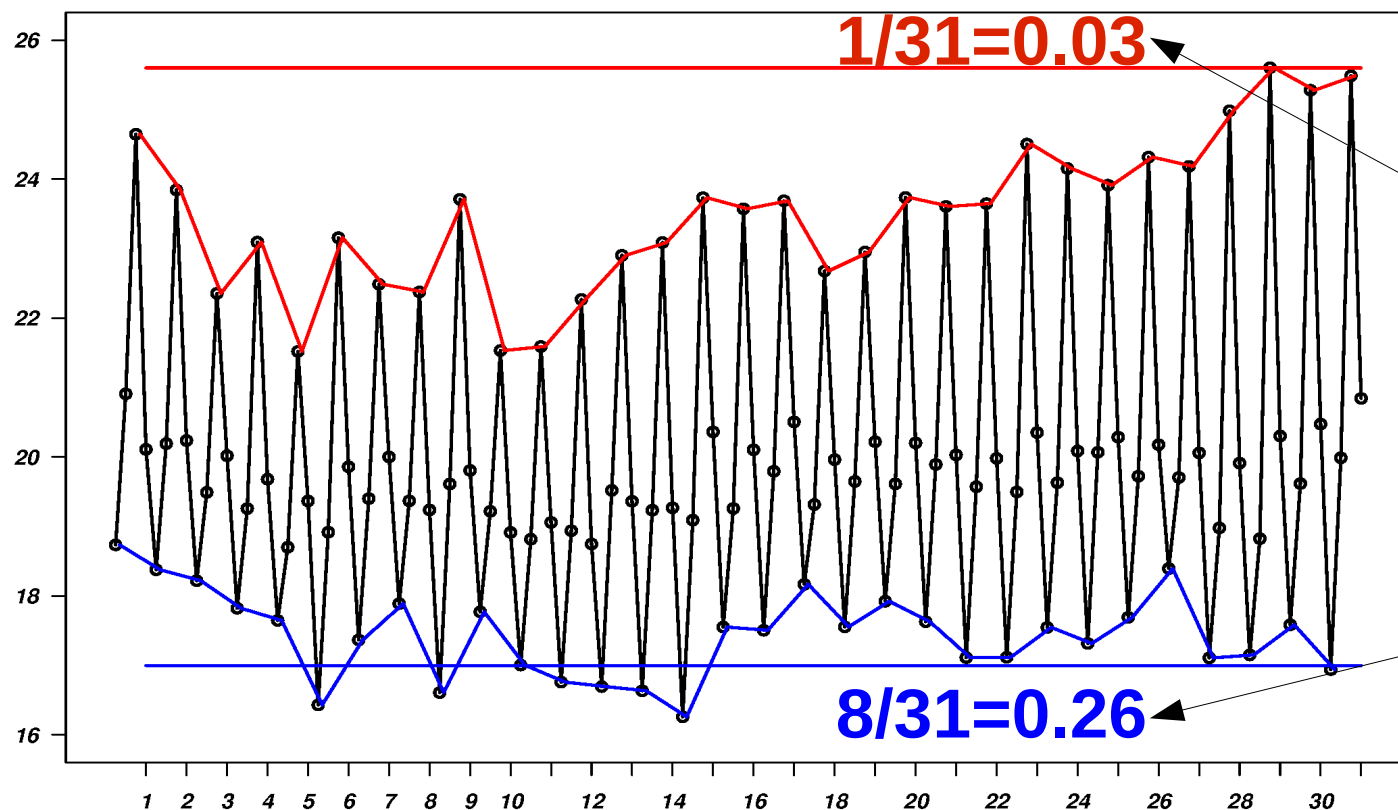


Percentage of days
Over the
Climatological 90th
Percentile of Tx
over the whole period
(1981-2010)

Percentage of days
Under the
Climatological 10th
Percentile of Tn
over the whole period
(1981-2010)

Focus on the “extremes”

Temperature (°C) in May 1985 in INIT (6 hourly)



Percentage of days
Over the
Climatological 90th
Percentile of Tx
over the whole period
(1981-2010)

Percentage of days
Under the
Climatological 10th
Percentile of Tn
over the whole period
(1981-2010)

Correlation over Europe

Correlation with ERAInt in JJA
(Residual of the regression
with the Global Mean Temperature)

CLIM

INIT-CLIM

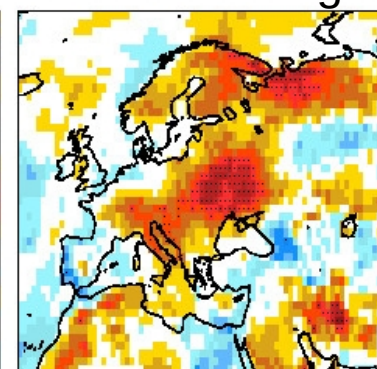
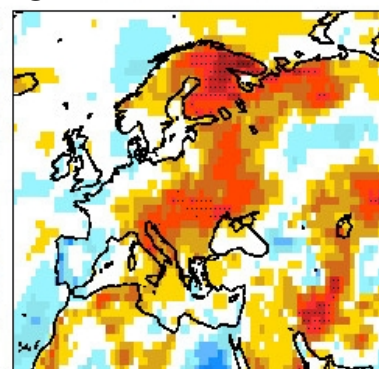
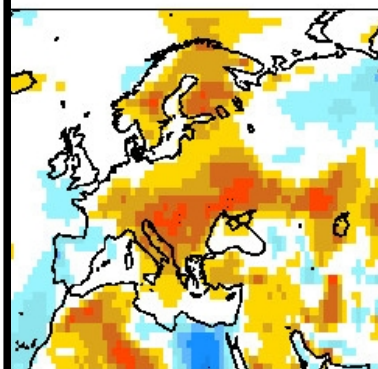
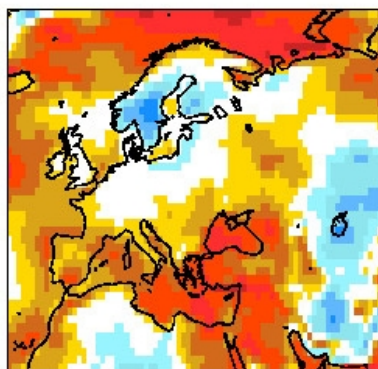
Monthly mean

Monthly mean

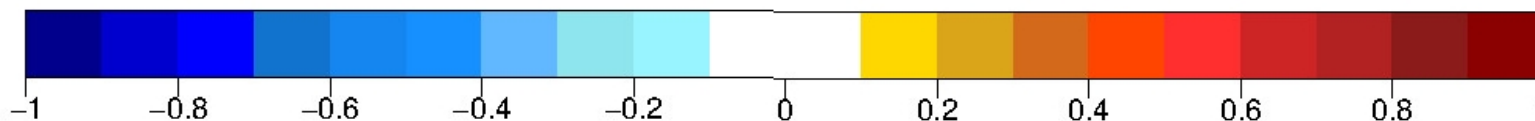
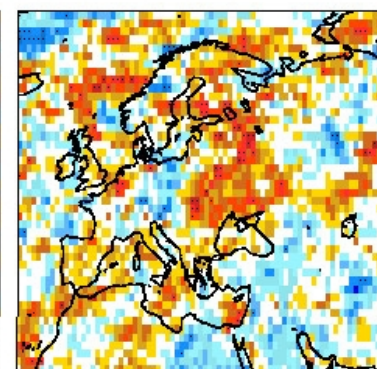
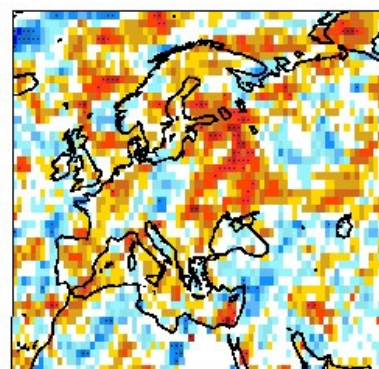
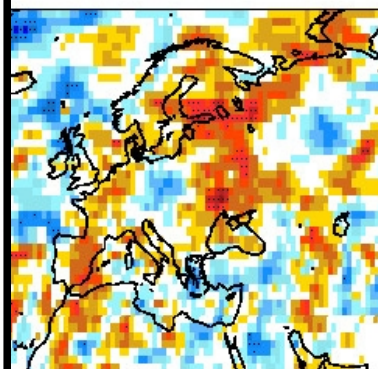
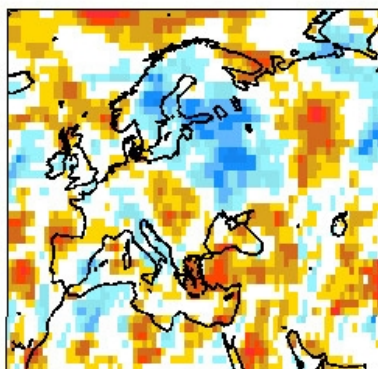
Monthly q90
of Tx

Nb of days
over climatological q90

2m temp

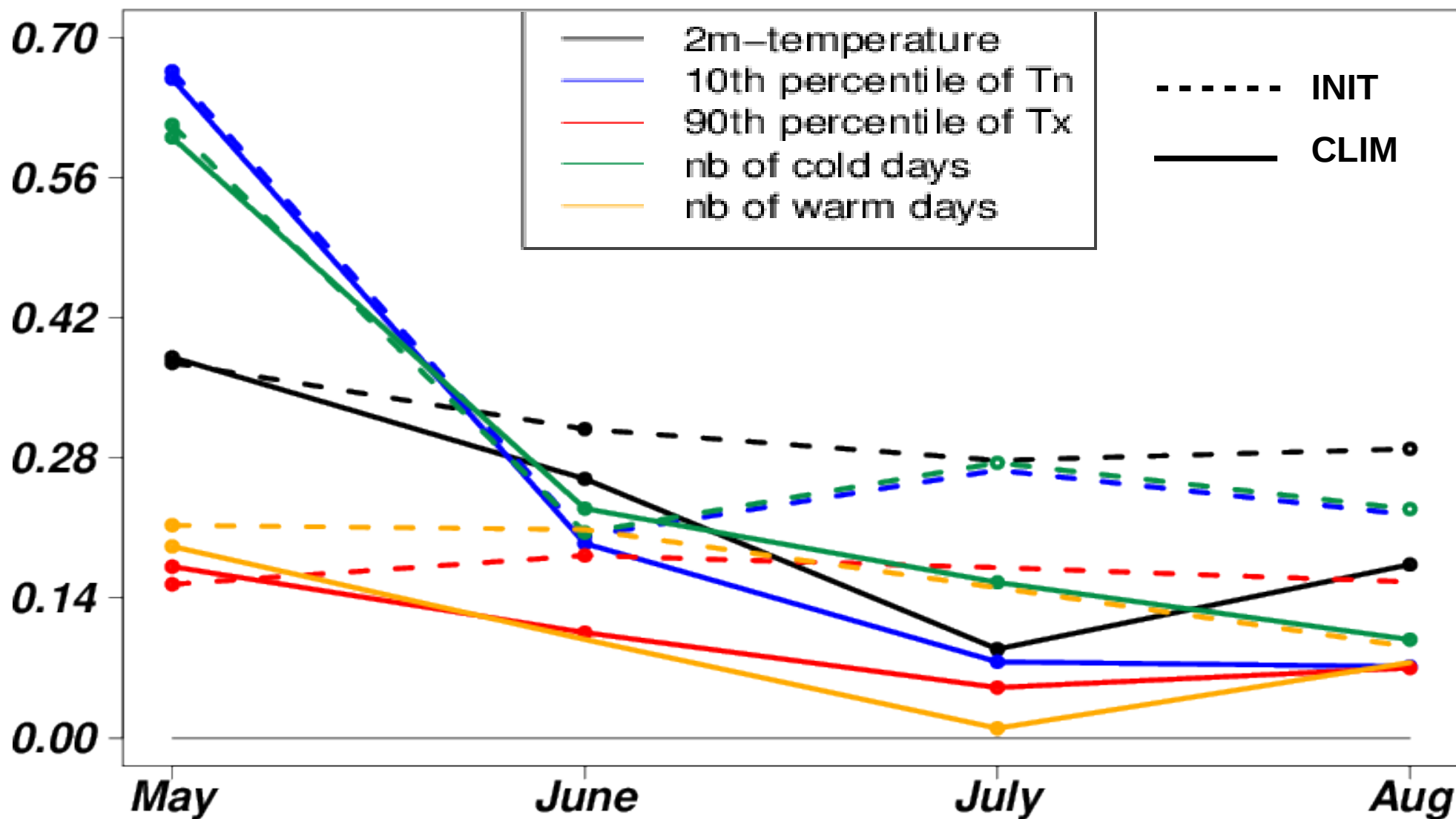


Precip



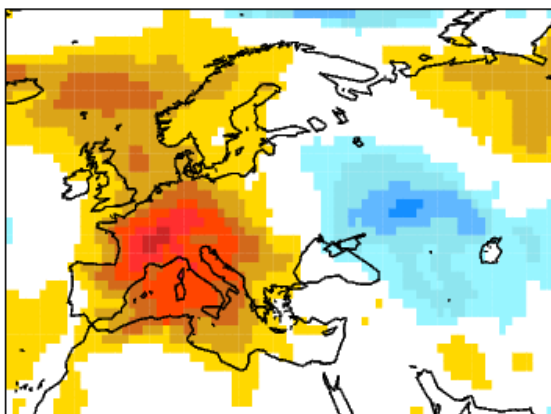
MACC over Europe

Correlation with ERAint in JJA

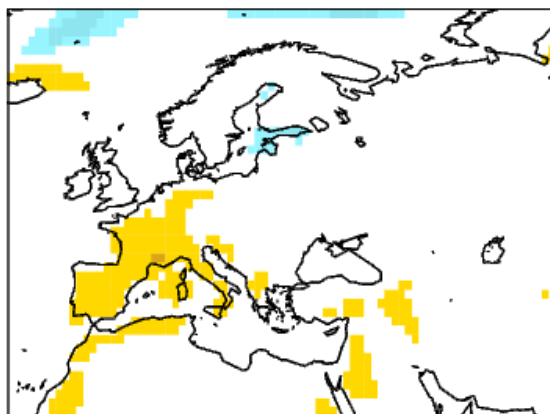


Case study: JJA 2003

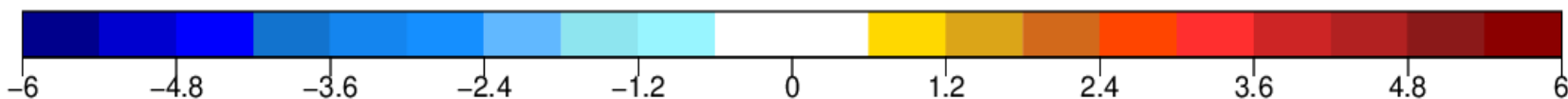
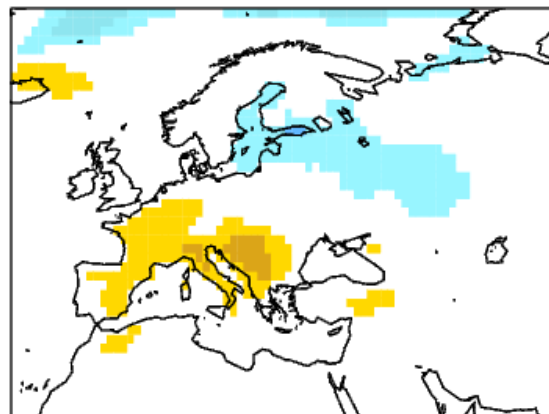
ERAint: 2m temperature



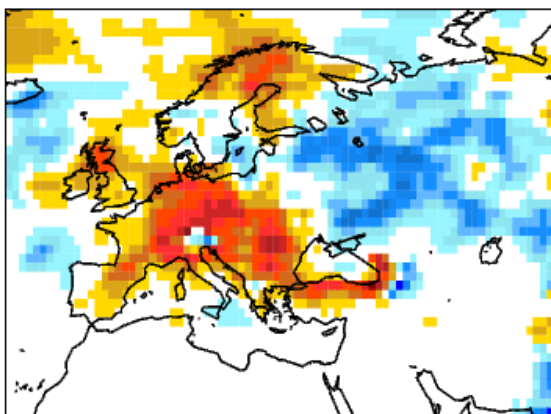
CLIM: 2m temperature



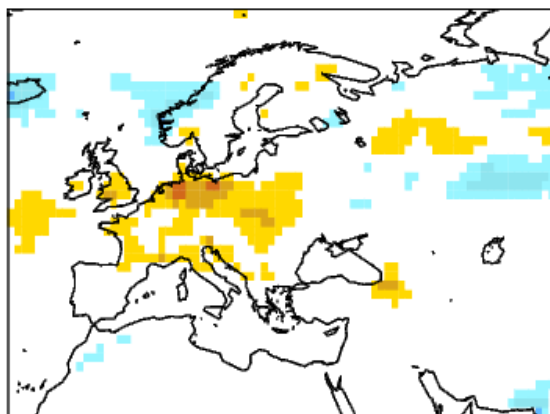
INIT: 2m temperature



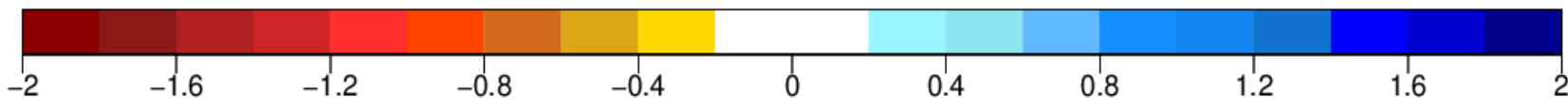
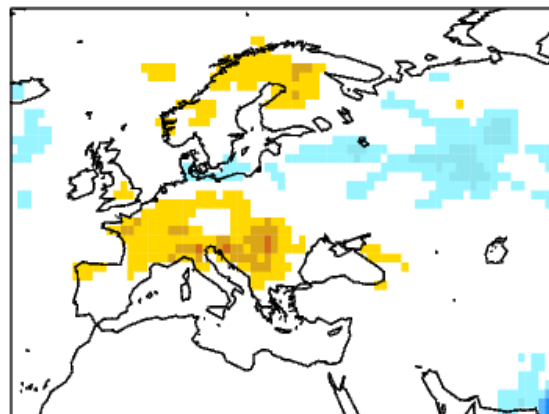
ERAint: Precip



CLIM: Precip

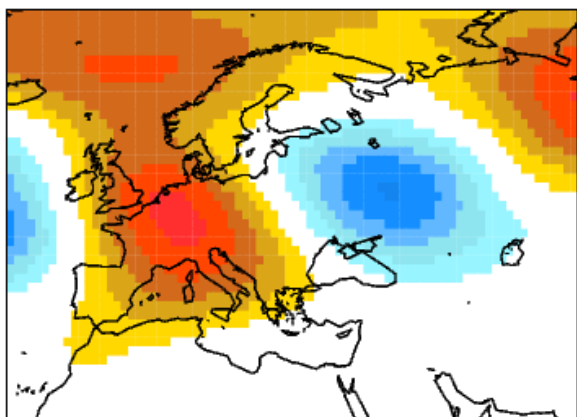


INIT: Precip

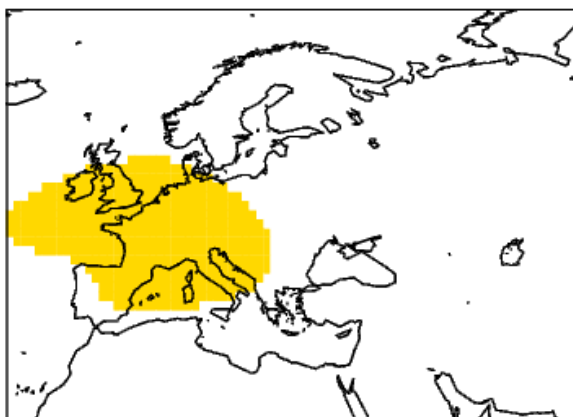


Case study: JJA 2003

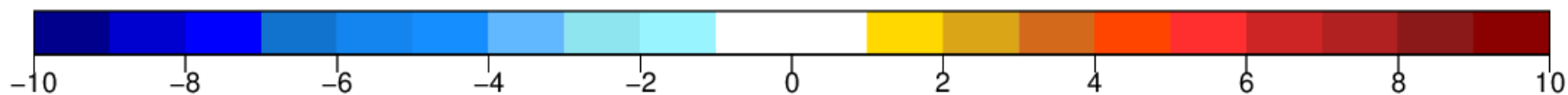
ERAint: g500



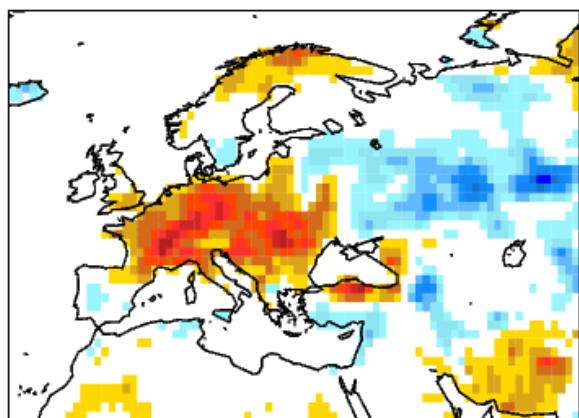
CLIM: g500



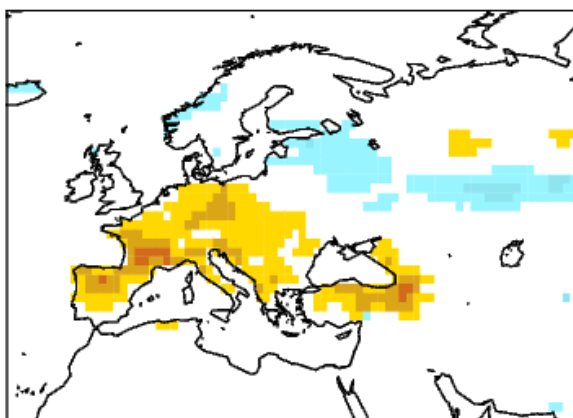
INIT: g500



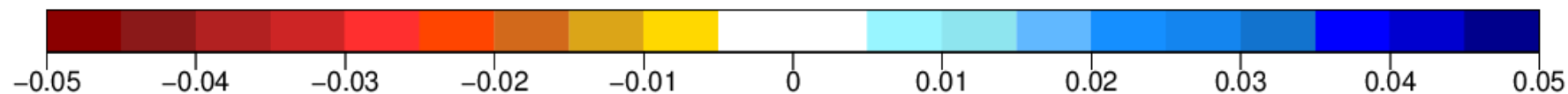
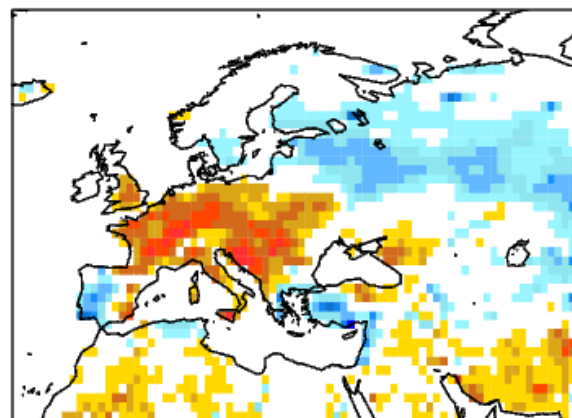
ERAint: soil moisture



CLIM: soil moisture

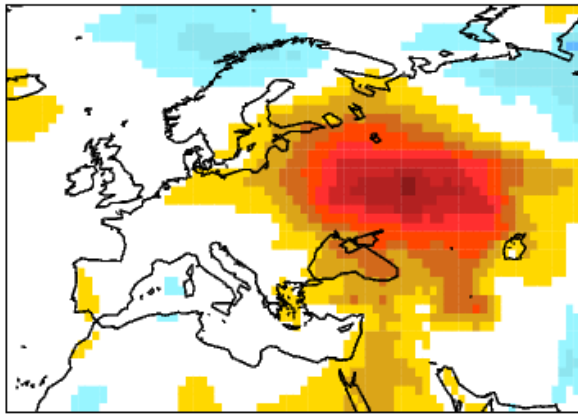


INIT: soil moisture

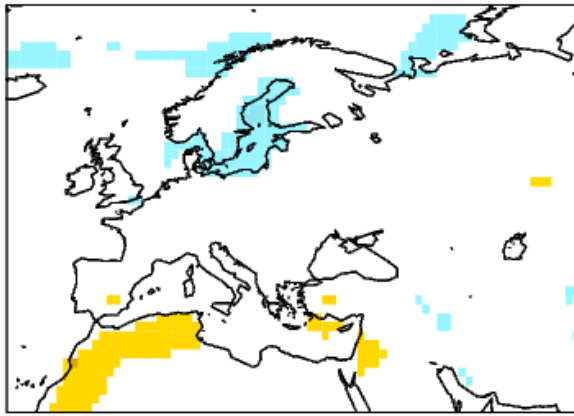


Case study: JJA 2010

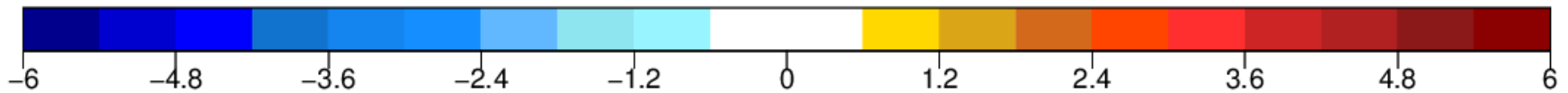
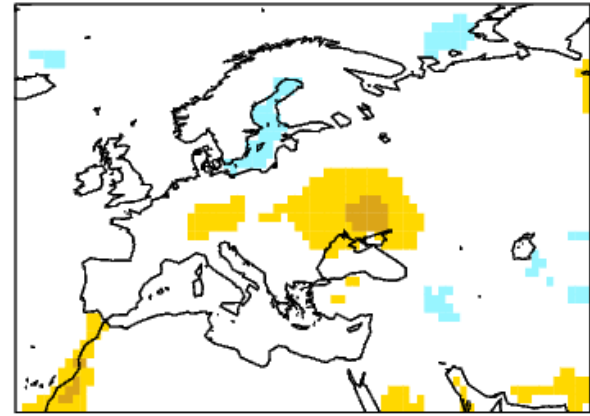
ERAint: 2m temperature



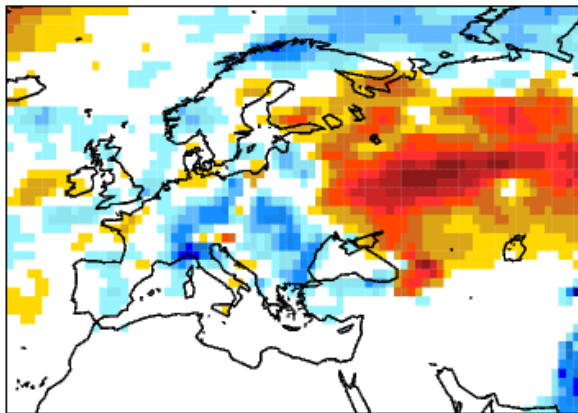
CLIM: 2m temperature



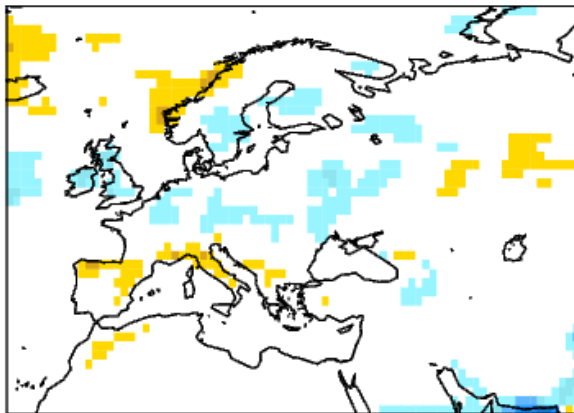
INIT: 2m temperature



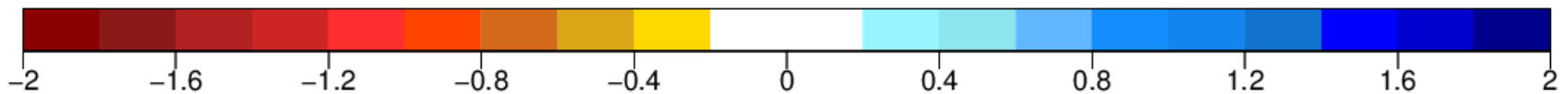
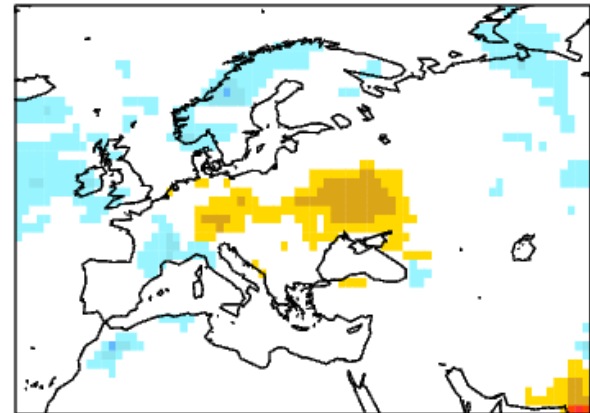
ERAint: Precip



CLIM: Precip

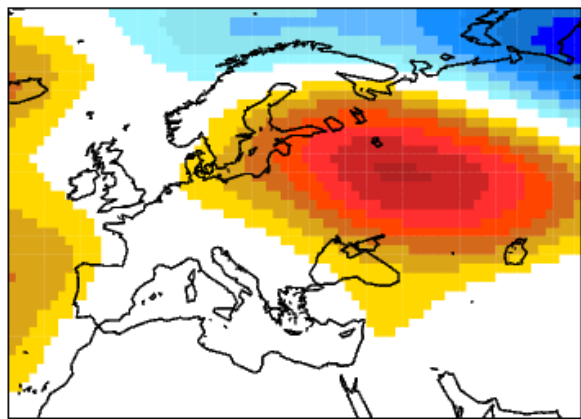


INIT: Precip

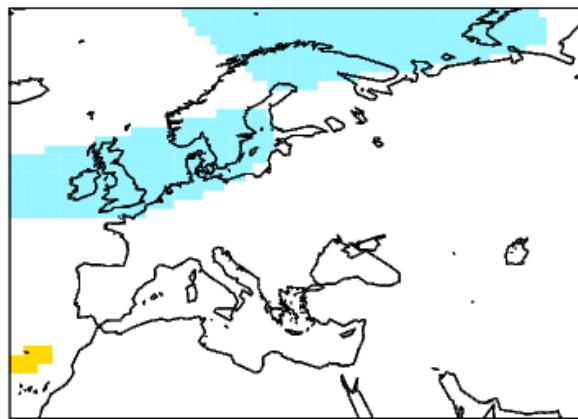


Case study: JJA 2010

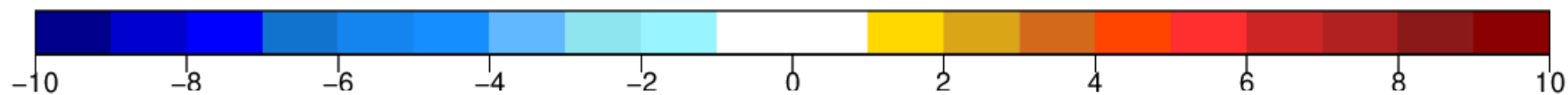
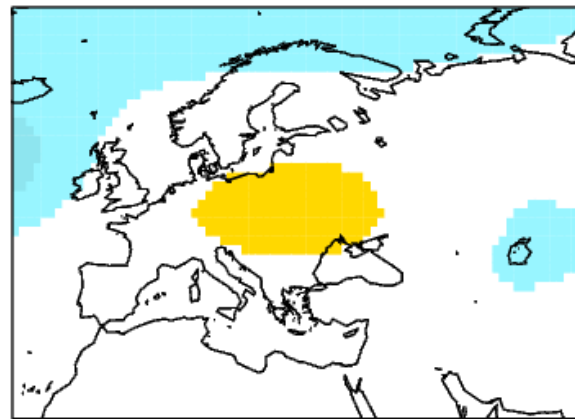
ERAint: g500



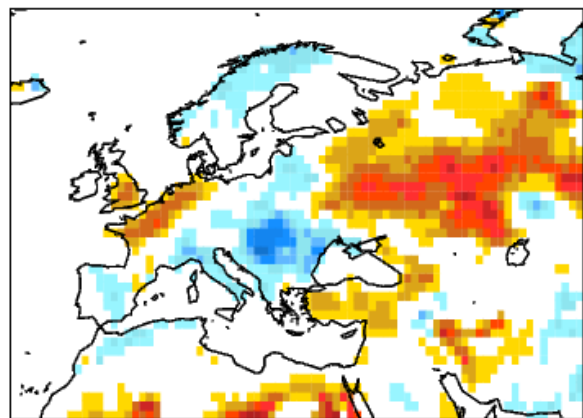
CLIM: g500



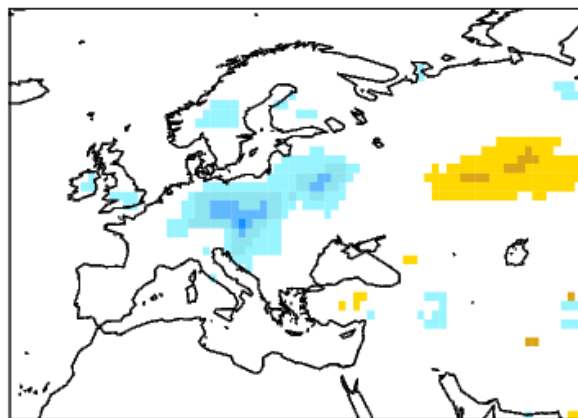
INIT: g500



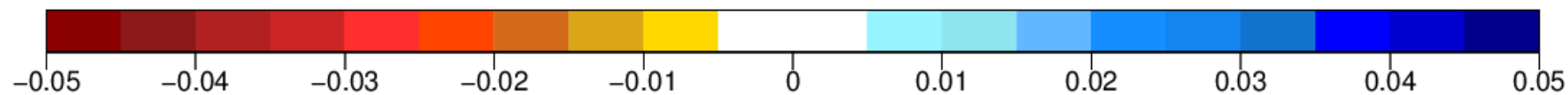
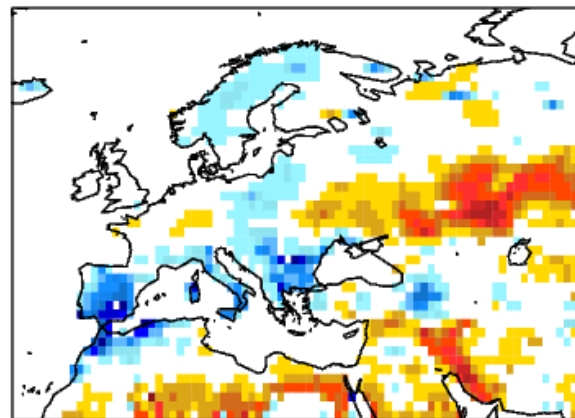
ERAint: soil moisture



CLIM: soil moisture



INIT: soil moisture



Conclusion and prospects

- Initializing soil moisture leads to a global improvement of the forecast skills of temperature and precipitation (especially over Europe)
 - Initializing soil moisture improves skill especially for extreme variables
 - The trend is better represented when the soil moisture is initialized
 - In both 2003 and 2010 the soil moisture feedback are important for the occurrence of the heat wave
 - In 2003: the soil moisture anomalies seems to be generated by the atmospheric conditions
 - In 2010: The initial condition of soil moisture plays a role in the development of the heat wave
-
- **Better understand physical processes behind these improvements:**
 - Investigate the evolution of soil moisture during 2003 and 2010
 - **Same simulation are currently running with EC-Earth 3.1 at low (T255ORCA1) and high (T511ORCA025)**
 - investigation of impact of soil moisture and snow initialization on extremes, NAO, Indian Monsoon onset....